



# Direct Reading Exposure Assessment Methods (DREAM): A Large Chemical Producer's Perspective

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## Topics

- Current DREAM use in the chemical industry
- Considerations in current DREAM use
- Considerations for Future DREAM Development



## Current DREAM Use

- Most common use: confined space clearance / entry
  - LEL / Oxygen assessment
    - » most important
    - » Requires simple, rugged, reliable instruments workers can operate
    - » Many good instruments currently available
  - Chemical assessment
    - » Often single gas / vapor
    - » “Go / no go” clearance indicator
    - » Common techniques:
      - “length of stain” tubes
      - Photoionization detectors
      - Lab analysis if no acceptable DREAM



## Current DREAM Use (con't)

- Industrial Hygiene Uses
  - Field exposure screening
  - Exposure contribution assessment
  - Task procedure improvement
  - Common methods
    - » Photoionization (PID)
    - » Flame Ionization (FID)
    - » Infrared (IR)
    - » Portable GC-(PID, FID, MS, ECD,...)
    - » Colorimetric badges





## Considerations in Current DREAM Use

- Method Selection involves balance of many factors:
  - Detection limit vs. range
  - Specificity vs. broad applicability
    - » Single component monitoring?
    - » Single component with a mixture present?
    - » Multiple component monitoring?
  - Initial cost vs. long-term value
    - » Leveraging use of costly instrument
      - IH & fugitive emissions
      - Centralized loan service
    - » Cost of consumables, repairs, calibrations
  - Worker-performed sampling vs. trained instrument operator
  - Datalogging vs. visually read in the field
  - Portable vs. “luggable”



## Considerations in Current DREAM Use (con't)

- Accuracy more important than precision
  - Most IH decisions are “single significant digit”
- Most common problem in IH DREAM use: insufficient consideration of use environment
  - Other detectable species present
  - Effects of humidity, temperature, dust
  - Sufficient / relevant calibration
- DREAM may be a substitute when IH lab services not available or extremely expensive (not uncommon outside US)
- DREAM sometimes crucial for medical treatment decisions (e.g., phosgene badge)



## Considerations for Future DREAM Development

- Improved analyte specificity
  - » Compound libraries, “fingerprinting” schemes
  - » Automated rather than user-dependant
- Applications for more VOCs (ethylene, acrylonitrile, ethylene oxide; all that have a TLV<sup>®</sup>?)
- Error / fault checking and notification
- Environmental compensation (e.g., humidity, temperature correction)
- Datalogging with ready export to common software (e.g., Excel)
- Easily worn by worker
- Improved value / cost of ownership
  - » Multiple applications
  - » Reliability
  - » Consumables cost & shelf life